GENERAL SCIENCE PAPER – I

(English version)
Parts A and B

Time: 2½ Hours]   **[Maximum Marks: 50**

Instructions:

1.   Answer the questions under **Part –A** on a separate answer book.
2.   Write the answers to the questions under **Part – B** on the Question Paper itself and attach it to the answer book of **Part – A**

Part – A

Time : 2 Hours   **Marks : 35**

<u>SECTION – I</u>   *5 x 2 = 10*

NOTE:
1.   Answer **ANY FIVE** questions, choosing at least **TWO** from each of the following Groups.
2.   Each question carries **2** marks.

GROUP – A

1.   Distinguish between a Rotatory motion and a circular motion?
2.   State inverse square law of magnetism?
3.   Mention the applications of electrolysis?
4.   Name three high level languages of computer?

GROUP – B

5.   What ate the upper and lower limits of 'm' for $l = 4$
6.   Draw the shapes of CO_2 and NH_3?
7.   15 ml of Hexane is mixed with 45ml of Heptane. Calculate the V% of this solution?
8.   Write names of two harmones?

SECTION – II   *4 x 1 = 4*

1. Answer any **FOUR** questions in one or two sentences.
2. Each question carries **ONE** mark

9. What is acceleration due to gravity?
10. Explain the phenomenon of resonance?
11. What are Isotopes? Give examples?
12. What is the value of Planck's constant?
13. Arrange the following acids in the increasing order of their volatility? HCL, H_2SO_4 and CH_3COOH
14. What are primary nutrients?

SECTION – III   *4 x 4 = 16*

NOTE:
1. Answer any **FOUR** questions choosing at least **TWO** from each group
2. Each question carries **FOUR** marks.

GROUP – A

15. Give a comparison between Newton's corpuscular theory and Wave theory of light?
16. Draw a neat diagram showing important parts of Dynamo. Explain its construction and working?
17. What is the principle of Nuclear Reactor? How is a chain reaction controlled in a nuclear reactor?
18. What are the properties and uses of Junction Diode?

GROUP – B

19. State the postulates and defects of Bohr's atomic model?
20. Explain how Sigma (σ) and Pie (π) bonds are formed?
21. Explain long form of periodic table?
22. Describe the manufacture of Cement?

SECTION – IV   *1 x 5 = 5*

NOTE:
1. Answer any **ONE** of the following questions.
2. It carries **FIVE** marks.

23. Draw the diagram showing the Positive error and Negative error of a Screw Gauge?
24. Draw the diagram showing the manufacture of sugar from sugar cane?

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19T (B)

GENERAL SCIENCE, PAPER – I

(English Version)
Parts A and B

Time : 21/2Hours]   **[Maximum Marks : 50**

Part – B

Time : 30 Minutes   **Marks : 15**

Instructions:
1. Choose the correct answer from the given options and write the corresponding answers (A,B,C,D) in the brackets provided with Capital Letters.
2. Each question carries ½mark.
3. Answers with overwriting are not valued.
4. Answer all the questions.

I.   Choose the correct answer and mention the corresponding letter in the bracket provided

10 x ½=5

1. According to Keppler' s concept, the orbit of a planet around the Sun is ------   (   )
    A)   Circular   B) Elliptical   C) Rectangular   D) Linear
2. Radio waves have wavelengths from   (   )
    A) 1m to 100 km   B) 10m to 1 Km   C) 1m to 1 Km   D) 1m to 50 Km
3. ------- is used to take photographs of objects in darkness   (   )
    A) I.R.Spectrum   B) Radio waves   C) UV Specrum   D) Microwaves
4. Aluminium is an example for ------------- magnetic substance   (   )
    A)Dia   B) Para   C) Ferro   D) None
5. If three cells of 1V, 1.5V, and 2V are connected in parallel, then the total emf will be   (   )
    A) 2.5V   B) 2V   C) 1.5V   D) 4.5V
6. Among 3p, 4s, 3d and 4p which orbital has least energy   (   )
    A) 4s   B) 3p   C) 3d   D) 4p
7. Which of the following is an ore of Mg   (   )
    A) Berl   B) Barytes   C) CarnaliteD) Haematite
~   Weak acids ionize upto   (   )
    A) 50%   B) 100%   C) Less than 100%   D) More than 100%
9   Drugs which act on blood circulation are   (   )
    A) Harmones   B) Vitamins   C) Cardio-Vascular   D) Anti biotics
10. Bond length in Graphite is   (   )
    A) 2.45 A^0 B) 1.42 A^0 C) 4.21 A^0 D) 2.81 A^0

II.   Fill in the blanks. Each question carries ½marks   **10 x ½= 5**

11. Time of ascent is directly proportional to --
12. When a body is projected upwards, its acceleration due to gravity is taken as --------------
13. Distance between two successive nodes is -----------------------------
14. The size of corpuscles are --------------------- for different colours.
15. Permeability of free space μ_0 = -------------------------- Henry/meter
16. Naphthalene is soluble in --------------------------
17. The presence of alcoholic functional group is tested by addition of -------------- metal.
18. ------------------ is the by-product of alcohol industry.
19. Cullet is --------------------------------------
20. Deodorant soap contains ---------------------------

Match the following   10 x ½= 5

GROUP: A

21.   Atomic number   (   )   A)   Stability of atom
22.   Mass defect   (   )   B)   amu
23.   Mass number   (   )   C)   number of protons
24.   Unit of atomic mass   (   )   D)   eV
25.   Unit of energy   (   )   E)   Sum of the number of protons and neutrons.

GROUP: A   GROUP : B

26.   Methane   (   )   A) C_2H_6
27.   Ethane   (   )   B) C_2H_2
28.   Propane   (   )   C) C_2H_4
29.   Ethylene   (   )   D) C_3H_8
30.   Acetylene   (   )   E) CH_4

ANSWERS FOR PART – B

1) B   2) A   3) A   4) B   5) B   6) B   7) C   8) C   9) C   10) B

11) Initial velocity   12) negative   13) $\lambda/2$ 14) different   15) 4π x 10^{-7}
16) Kerosene   17) Sodium (Na)   18) CO_2 19) broken glass pieces
20) 3,4,5 tri bromo salicylanilide

21) C   22) A   23) E   24) B   25) D
26) E   27) A   28) D   29) C   30) B

PART: A

ANSWERS

1.   Distinguish between a Rotatory motion and a Circular motion?
Ans:

	Rotatory motion			Circular motion
1.	A body is said to be in rotatory motion if every particle moves in a curved path about a fixed point.		1	Circular motion is a special case of rotatory motion
2	Rotatory motion is characterized by changing linear velocity (v) and radius vector (r)		2	In circular motion the magnitude of velocity does not change while direction alone changes.

2.   State inverse square law of Magnetism?

Ans: Inverse square law of magnetism

The inverse square law of magnetism state that the force of attraction or repulsion between two magnetic poles (F) is directly proportional to the product of their pole strengths (m_1 and m_2) and inversely proportional to the square of the distance (r^2) between them and acts along the line of joining the poles.

$$F \propto m_1.m_2 \rightarrow 1$$
$$F \propto 1/r^2 \rightarrow 2$$
$$F \propto m_1 m_2 /r^2$$
$$F = \mu_0 /4\pi \; m_1 m_2 /r^2$$

μ_0 is the permeability of air.

$\mu_0 = 4\pi \;$ x 10^{-7} Henry / meter

3.   Mention the applications of Electrolyte?

Ans: Applications of electrolyte

1) Electrolysis is used in metallurgy for extracting and refining of metals
2) Electrolysis process is also used in electroplating in which a base metal is coated with a thin film of costlier or less corrodible metal.
3) Electrolysis is also used in electrotyping which is a process of obtaining exact copy of an engraved block containing of letters or figures.

4.   Name 3 high level languages of computer?

Ans: Some of the high level languages of computer are BASIC, COBOL, FORTRAN, C, C^{++} , JAVA, etc.

5.   What are the upper and lower limits of '*m*' for $l = 4$?
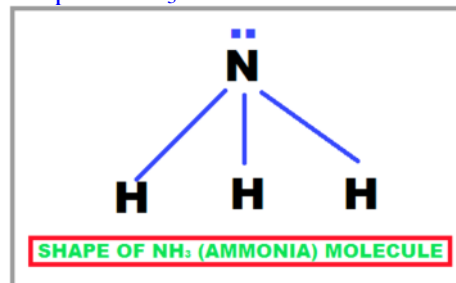
Ans: The upper limit of *m* is -4 and the lower limit is +4.

6.   Draw the shapes of CO_2 and NH_3?

Ans: Shape of CO_2 Shape of NH_3

SHAPE OF NH₃ (AMMONIA) MOLECULE

O == C == O

7.   15 ml of Hexane is mixed with 45 ml of Heptane. Calculate the Volume percentage of this solution?

Ans: Data: Volume of Solute = 15ml

Volume of Solvent = 45 ml

Volume of Solution = 15 + 45 = 60ml.

To be found: Volume percentage of solution.

Formula: V % = Volume of solute / Volume of solution x 100

Solution: V% = 15/60 x 100

= 25.

8.   Write the names of two harmones?

Ans: Insuline and Cardisone are the examples of Harmones.

9.   What is acceleration due to gravity?

Ans: The uniform acceleration produced in a free falling body due to gravitational pull of the earth is known as acceleration due to gravity 'g '.

10. Explain the phenomenon of Resonance?

Ans: The phenomenon in which if one of the two bodies of the same natural frequency is set into vibration, the other body also vibrates under the influence of the first body.ory

11. What are isotopes? Give examples?

Ans: Atoms of the same element having same atomic number but different mass number are called Isotopes of that element.

Ex: Isotopes of Hydrogen: $^{1}H_{1,}$ $^{2}H_{1,}$ $^{3}H_{1}$

Isotopes of Uranium: $^{235}U_{92,}$ $^{238}U_{92}$

Isotopes of Neon: $^{20}Ne_{10,}$ $^{21}Ne_{10,}$ $^{22}Ne_{10}$

12. What is the value of Planck's constant?

Ans: The value of Planck's constant is 6.625×10^{27} erg.sec (or) 6.625×10^{-34} Joule.sec.

13. Arrange the following acids in the increasing order of volatility?

Hcl, H_2SO_4, and CH_3COOH

Ans: $CH_3COOH > Hcl > H_2SO_4$

14. What are primary nutrients?

Ans: Nitrogen (N), Phosphorous (P), and Potassium (K) are the primary nutrients.

15. Give a comparison between Newton's Corpuscular theory and Wave theory of light?

Ans:

	Newton's corpuscular theory		Huygen's wave the
1	It assumes that light consists of a stream of extremely small particles called corpuscles.	1	It assumes that light travels in the form of a wave.
2	The rectilinear propagation of light is explained by the straight line motion of corpuscles.	2	The rectilinear propagation of light is explained by the advancement of wavefront along the direction of normals drawn to it.
3	The colours of light are due to difference in the sizes of corpuscles.	3	The colours of light are due to differences in the wavelengths.
4	The reflection and refraction are explained by the repulsion and attraction of the corpuscles by the medium.	4	The reflection and refraction are explained by the construction of secondary wave fronts applying Huygen' s principles.
5	It cannot explain the phenomenon of interference, diffraction and polarization of light.	5	It can explain the phenomenon of interference, diffraction and polarization of light.
6	It predicts that the velocity of light in a denser medium is greater than that in a rarer medium.	6	It correctly proves that the velocity of light in denser medium is less than in a rarer medium.

16. Draw a neat diagram showing important parts of a Dynamo. Explain its construction and working?

Ans: Diagram of Dynamo:
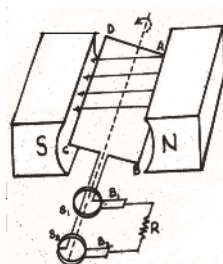
Description of Dynamo:

A dynamo is an electrical device which converts mechanical energy into electrical energy utilizing the phenomenon of electromagnetic induction.

1) Armature: The armature ABCD consists of a coil made of insulated copper wire and is wound on a cylindrical soft iron core. The armature is rotated rapidly about a horizontal axis perpendicular to the magnetic field.

2) Permanent Magnet: NS is a permanent horse-shoe magnet. It provides stationary magnetic field.

3) Slip rings: The ends of armature coil are connected to two different slip rings S_1 and S_2 respectively. The rings are insulated from each other. These rings rotate along with the armature about the same axis as that of the coil.

4) Carbon brushes: Two carbon brushes B_1 and B_2 are always in contact with the slip rings S_1 and S_2 respectively. The other two ends of B_1 and B_2 are connected to an external circuit containing load resistance 'R'

WORKING

- When the armature ABCD is rotated in anti-clock wise direction, the magnetic flux linked with it changes.
- As a result, current is induced in the coil and flows through the load resistance R.
- The changes in the magnitude of induced current with the change in the position of armature coil in the magnetic field during one complete cycle i.e. during a rotation through an angle 0 to 2π is shown graphically.
- Thus rapid rotation of the armature in the dynamo generates current or voltage in the external circuit whose direction alternates in each half-cycle. Hence, such currents are called alternating currents (AC).
- On the other hand, if half – slip rings are arranged and the two ends of the coil are alternately in contact with the slip rings, a direct current (DC) is generated. Then the dynamo is called DC dynamo.

17. What is the principle of a nuclear reactor? How is a chain reaction controlled in a Nuclear reactor?

Ans: Principle of a nuclear reactor:

The controlled chain reaction is the basic principle on which nuclear reactor functions.

These are the sources for the generation of electric power. The essential features of a nuclear reactor are 1) The fuel, 2) Moderator 3) Control rods, 4) Radioactive Shielding 5) The coolant.

1) FUEL:

The fissionable material used in the reactor is called fuel. Isotopes of Uranium, Plutonium, and Thorium are commonly used fuels. The rods of these fuels are tightly sealed in aluminium cylinders.

2) MODERATOR:

The purpose of using moderator is to slowdown the fast moving neutrons during the fission process. Heavy water or graphite or beryllium, or Hydro carbon plastics are some of the suitable material used as moderator.

3) CONTROL RODS:

These absorb the neutrons and control the chain reaction. Cadmium or Boron rods are generally used for this purpose.

4) RADIATION SHIELDING:

Lead blocks, Concrete walls of thickness 10m are used to prevent spreading of radioactive effect to the space around the nuclear reactor. This is called radiation shielding.

5) COOLANT:

The substance used to absorb heat generated in the reactor is called the coolant. Generally Water with pumps is used as coolant.

WORKING

The reactor core (consisting Moderator and Fuel rods) and pump are in contact with a heat exchanger which is generally water. This water changes into steam which is utilized to turn the turbine.

18. State the properties and uses of Junction Diode?

Ans: Properties of Junction Diode:

Forward bias:

1) In a p-n junction diode, when p-side is connected to the positive terminal and n-side is connected to the negative terminal of a battery, diode is said to be in 'forward bias' condition.
2) In this Forward bias condition a junction diode offers low resistance and conducts electricity.

Reverse bias:

1) In a p-n junction diode, when p-side is connected to the negative terminal and n-side is connected to the positive terminal of a battery, diode is said to be in "re verse bias" condition.
2) In this reverse bias condition, a junction diode offers high resistance and no current flows in the circuit.

Uses:
1) A p-n junction diode can be used as an electronic switch.
2) In a rectifier circuit, a p-n junction diode is used.

Conversion of Alternating Current (AC) into Direct Current (DC) is known as rectification.

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3) Certain p-n junction diodes glow on supply of electricity. Such diodes are called Light Emitting Diodes (LEDs). These are used in digital clocks and digital calculators.

19.   State the postulates and defects of Bohr's atomic model?
Ans: Postulates of Bohr's atomic model:
- Electrons move with high velocity around the nucleus in specified paths called "orbits" or " shells". As long as the electron is in a particular orbit its energy is constant. These orbits are called "Stationary orbits or Stationary shells".
- Each stationary orbit corresponds to a definite energy. These stationary orbits are designated by numericals 1,2,3….. or the letters K, L, M, N,……………. The energy of the orbit increases with its distance from the nucleus.
- When an electron jumps from a higher energy orbit to a lower energy orbit, the difference in energy is emitted as radiation.
$$E_2 - E_1 = h\nu$$
   Where E_2 and E_1 are the energies of higher and lower orbits.
   ν is the frequency of radiation.
   h is the Planck's constant.
- The angular momentum (mvr) of the electron revolving in a stationary orbit is equal to integral multiple of $h/2\pi$ i.e. $mvr = nh/2\pi$
   Where m = mass of electron
   V = Velocity of electron
   r = radius of the orbit
   n = integer
   h = Planck's constant

Defects:
- Bohr' s theory could not explain the atomic spectra of higher elements such as He, Li, Be, B,C … … which have more than one electron.
- Zeeman Effect was not accounted by the Bohr's model.
- Bohr' s model could not justify the quantization of angular momentum.
- Bohr' s theory could not account for the formation of chemical bonds.

20.   Explain how Sigma (σ) and Pie (π) bonds are formed?
Ans: Formation of Sigma (σ) bond:
- In the end-on-end type overlap the end part of an orbital overlaps with the end part of another orbital.
- The resultant bond is Sigma (σ) bond.

- In this type of bond maximum orbital overlap takes place and therefore the bond formed is strong.
- σ bond can exist independently.
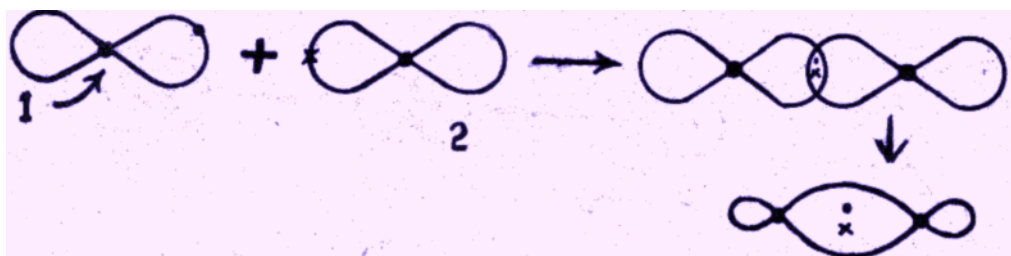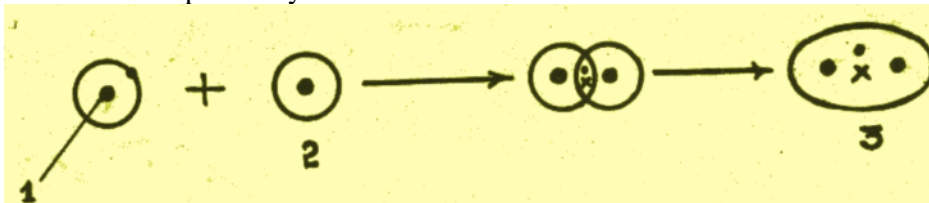
Formation of Pie (π) bond:

- An orbital overlaps with another orbital side ways.
- The bond formed by such an overlap is called Pie (π) bond.
- In this type of overlap, the extent of overlap is much less than in Sigma bond.
- This is a weak bond and cannot exist independently.
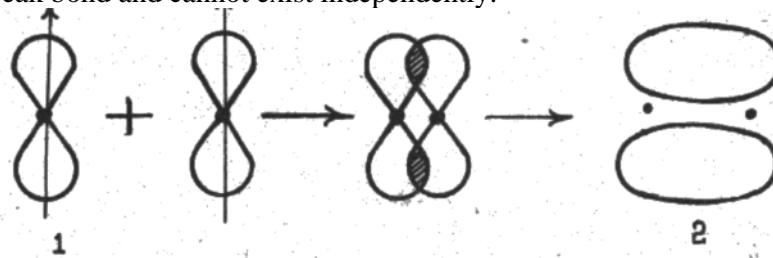
21. Explain the long form periodic table?

Ans: Modern periodic law:

The physical and chemical properties of the elements are the periodic function of their electronic configuration.

Main features of modern periodic table:

- It consists of 7 periods and 18 groups.
- First period has 2 elements. 2nd and 3rd periods each have 8 elements.
- 4th and 5th periods have 18 elements each.
- 6th period consists of 32 elements.
- 7th period is incomplete period.
- The elements with atomic numbers 58 to 71 are called Lanthanides and 90 to 103 are called actinides.
- Lanthanides and Actinides are kept separately at the bottom of the table.

22. Describe the manufacture of Cement?

Ans: Manufacture of Cement:

- The raw materials required for manufacturing of cement are Lime stone, Clay, Gypsum.
- Cement is manufactured by two methods a) Wet process b) Dry process.
- In wet process, a little amount of water is added to the homogeneous mixture to obtain raw slurry.

- In dry process, the raw materials are mixed in the required proportions and ground into a homogenous mixture to obtain raw meal.
- The raw meal or raw slurry is called as charge. It is heated in a rotatory kiln to about 1700 to 1900^{0}C
- At one edge of the kiln, the charge is introduced and at the other end hot gases are blown in.
- The rotaroty kiln slowly rotates and with this the charge moves slowly. It gets heated to form grey balls of cement called cement clinker.
- The clinker is mixed with 2-3% of gypsum and made into fine powder. This is called as Portland cement.
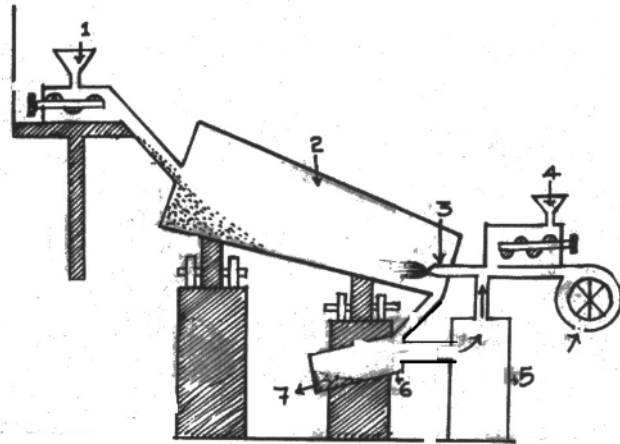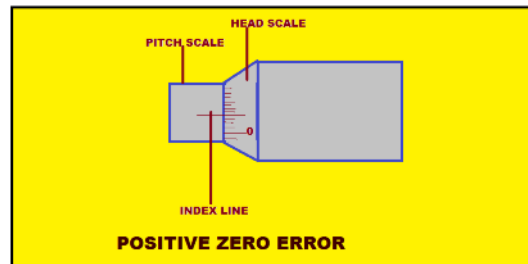

Parts

1) Charge   2) Rotatory kiln   3) Burner   4) Coal dust   5) Dust chamber
6) Cooler   7) Cement clinker.

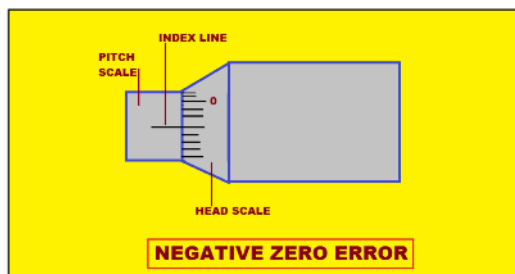23.   Draw the diagram showing the positive error and negative error of a screw gauge?
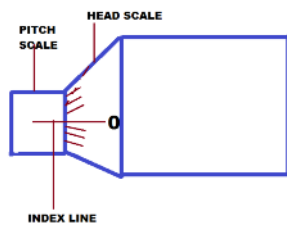
Ans:

24.   Draw the diagram showing the manufacture of Sugar from Sugar cane?

Ans: 1) Sugar cane, 2) Cutter knives   3) Mills 4) Bagasse   5) Lime, defacation
6) CO_2 Carbonation 7) SO_2 Sulphitation 8) Filters   9) Clarified juice 10) Steam
11) Boilers 12) Crystallization pan   13) Centrifuse   14) Sugar.